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(54) Electric heating panels

(57) An electric blanket is made by feeding fabric outer layers 6, 8 optionally with an inner foam layer 18 on one or both, through pressure rollers 10, 12, with hot melt adhesive 28 or 34, in particulate, net, or sheet form, on one or both of the inner surfaces, the adhesive being heated 42, 44 to softening point upstream of the rollers, an electric heating wire harness 46 being introduced between the layers as they pass through the rollers 10, 12. The adhesive is chosen so as not to form a permanent bond with the insulating sheath of the heating wire.

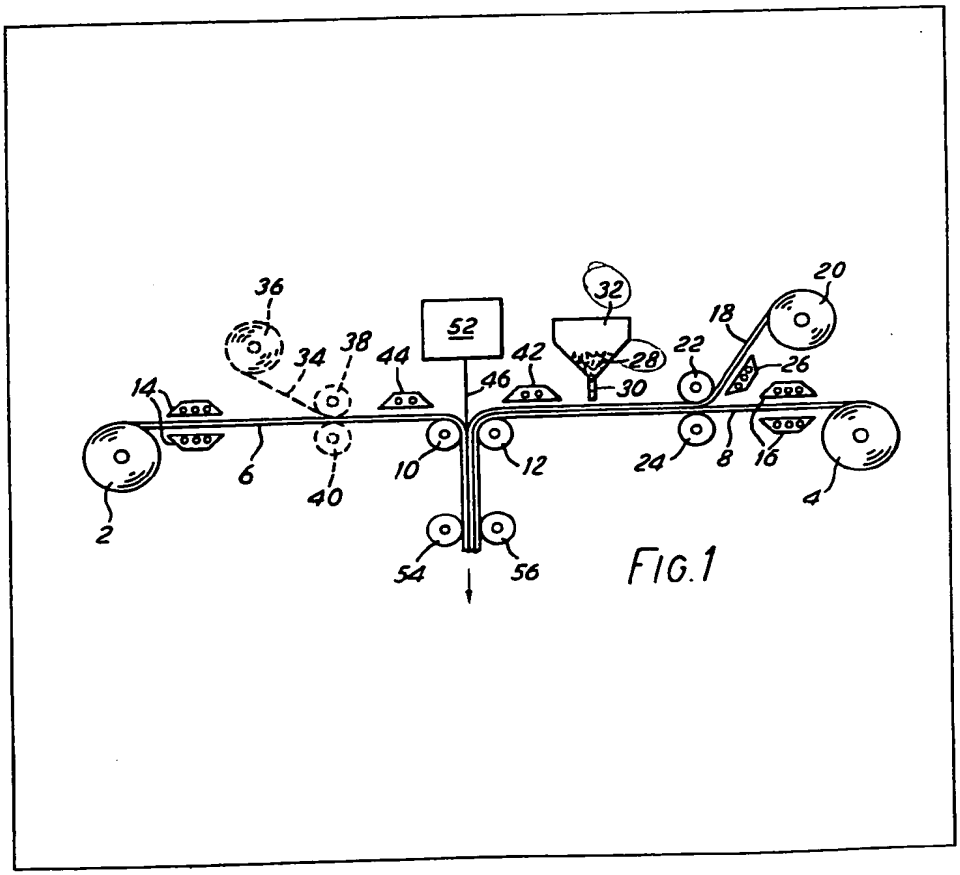

FIG.1

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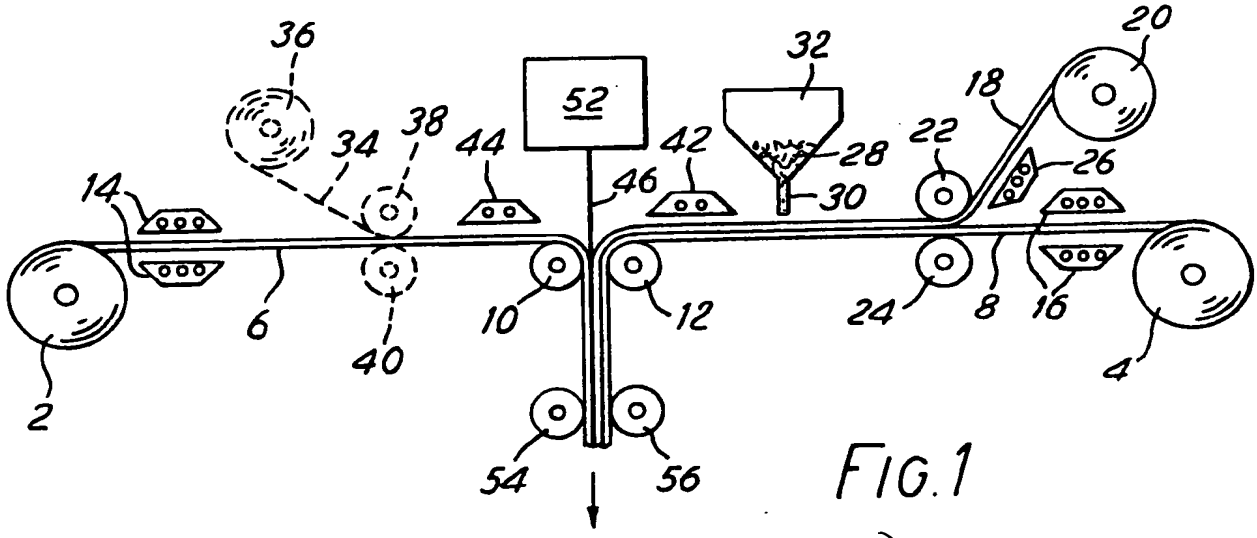
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FIG. 1

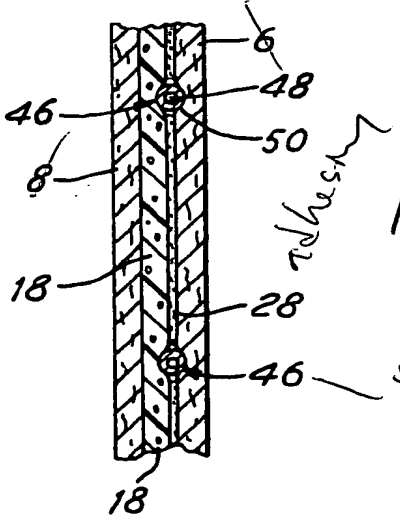
6
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FIG. 2

SPECIFICATION

Electric heating panels

Description

The invention relates to an electric heating panel, by which term is meant not only an electric blanket but also a heating pad for example a heated carpet underlay, the panel comprising outer layers adhesively laminated together with a heating element therebetween, and also to a method of and an apparatus for manufacturing such a heating panel.

Electric blankets conventionally comprise two layers of fabric with a heating element, and perhaps also a layer or layers of foamed material, received between them. The heating element must be held at least approximately in a desired pattern extending over the area of the blanket, and this can be achieved by securely connecting the two fabric layers together between adjacent runs of the heating element.

When the fabric is a non-woven fabric, securement together of the fabric layers can be effected by needling, which however requires rather elaborate and consequently expensive machinery. To avoid the need for such machinery, a solvent based adhesive can be employed to secure the layers together but this technique has some disadvantages. The adhesive tends to bond the heating element to the fabric layers so that the element is incapable of movement relative to the layers, for example when the blanket is folded, with an adverse effect on the working life of the element. Moreover, it is difficult to control the amount of solvent vapour in the atmosphere during manufacture, which involves a health risk for the operators. In addition, the newly laminated blanket cannot be handled for some hours after the application of the adhesive, to allow time for the adhesive to securely bond the layers together.

The invention accordingly provides an electric heating panel comprising first and second layers of flexible material laminated together by adhesive and an electric heating element received between the layers, the adhesive being a hot melt adhesive.

By the term hot melt adhesive there is meant herein an adhesive the condition of which is determined substantially only by its temperature, as opposed to adhesives which bond by a chemical action which is effectively irreversible. Hot melt or thermoplastic adhesives as here employed are heated to render them plastic for application to the surfaces to be bonded, and bonding takes place by cooling. After such cooling, the adhesives can again be softened by the application of heat. The release of solvent during bonding is thus completely avoided.

The adhesive is selected so as to have a softening temperature above the temperature of the heating element in normal use and is preferably such as not to form a bond, or at least not a permanent bond, with the heating element. The element is then capable of limited movement within the panel, so facilitating flexure and folding of the panel and thereby extending its useful life.

The invention also provides a method of manufacturing an electric heating panel wherein first and second layers of flexible material are fed into surface-to-surface engagement between pressure rollers, the engaged surface of at least one of the layers having hot melt adhesive thereon, the adhesive is heated prior to engagement with the other layer so as to be able to bond the layers together, and an elongate electric heating element means is positioned between the layers, whereby the layers are laminated together with the electric heating element therebetween.

The invention is further described below, by way of example, with reference to the accompanying drawing, in which:

Figure 1 is a schematic side view of an apparatus for manufacturing an electric blanket in accordance with the invention; and

Figure 2 is a partial schematic sectional view through an electric blanket manufactured by the apparatus of Figure 1.

The laminating apparatus illustrated in Figure 1 comprises support means for two supply rolls 2,4 of fabric. The fabric can be of any suitable material, synthetic or natural, and can be woven or non-woven; it is however convenient to employ a non-woven fabric of rayon. Webs 6,8 of the non-woven fabric are withdrawn from the rolls 2,4 and are fed towards each other along aligned generally horizontal paths to the nip of pressure roller 10,12. Suitable support or guide rollers or the like (not shown) are provided to help define these paths.

On leaving the supply roll, each fabric web undergoes a drying operation, to remove surplus moisture which would absorb energy applied to the web later on for the purpose of softening thermoplastic adhesive applied thereto. For this purpose, heating means, each conveniently as shown in the form of an opposed pair of electric radiant heaters 14,16 between which the web travels, are positioned immediately downstream of the supply rolls 2,4.

As shown at the right hand side of Figure 1, a foam layer is secured to the upper side of the fabric web 8 directly after the drying stage to add bulk to the blanket. The layer 18 can be of foamed plastics material; it is fed downwardly from a supply roll 20 so as to be received in overlying relationship with the web 8 in the nip of pressure rollers 22,24. A heater 26 heats the underside of the layer 18 immediately before it engages the web so as to soften the thermoplastics material of the layer. The pressure of the rollers 22,24 effects an effective permanent bond between the softened foam layer and the web, as the former hardens by cooling.

An adhesive 28 is then applied to the exposed upper surface of the layer 18. The adhesive 28 is a hot melt or thermoplastic adhesive, preferably a polyethylene adhesive, but a polyamide adhesive, or a mixture of the two, can be employed. The adhesive 28 can be in particulate form and the adhesive particles are then sprinkled over the surface of the layer 18 by a dispenser or distributor 30, gravity fed from a hopper 32. Instead, the adhesive can be in the form of a sheet or net 34. As shown in broken line at the left of Figure 1, the net 34 can be applied to the web 6 by being drawn from a supply roll 36 thereof and fed against the web by being passed with the web between pressure rollers 38,40. The net can

instead be laid on the web 6 under gravity.

Immediately prior to the laminating operation, which is effected by the rollers 10,12, the adhesive 28 is heated to a temperature at which it is capable of bonding together the fabric web 6 and the foam layer 18, and in the illustrated apparatus this is done by radiant heat supplied by an electric heater 42 positioned immediately upstream of the rollers 10,12. The web 6 can also be heated immediately prior to lamination, as by an electric radiant heater 44.

Between the web 6 and foam layer 18, there is introduced a heating element 46 comprising a metallic wire 48 in a sheath 50 of insulating material, for example a thermoplastic material. The heating element 46 is introduced between the web and the layer in a predetermined pattern by a laying up device schematically indicated by reference numeral 52. Any suitable pattern for the wire heating element 46 can be employed, depending for example on whether the eventual blanket is to have a single or multi-heat control arrangement.

The web 6 turns downwardly over the pressure roller 10, as do the web 8 and layer 18 over the roller 12, so that the web 6 and the layer 18 are laminated together by the adhesive 28 at the same time as the electrical harness constituted by the heating element 46 is introduced between them.

A reliable bond can be formed between the webs 6 and the layer 18 after these have travelled as far downstream of the pressure rollers 10,12 as is needed for the adhesive 28 to cool. The laminated blanket material thus formed is carried from the rollers 10,12 by driving means, for example drive rollers 54,56 as shown, to appropriate cutting and further processing equipment (not shown).

The adhesive 28 employed is of course selected so that it will not soften due to the heat generated in use by the heating element 46, that is, it has a softening temperature well above the maximum temperature likely to be experienced by the blanket in normal use. The adhesive 28 is preferably chosen also so that it will not form a bond with the insulating material of the sheath 50 of the wire 48. Although firmly restrained against lateral movement by the adhesion between adjacent surfaces of the web 6 and the layer 18, the element 46 is consequently capable of longitudinal movement within the tunnel in which it is secured, so that stresses on the blanket which occur on folding are reduced and the life of the blanket enhanced.

The adhesive, in any form, can be applied to the upper surface of both the web 6 and the layer 18 if preferred. The application of the adhesive need not take place immediately before the laminating step, but it can be applied to one or both of the surfaces to be bonded, with subsequent application of heat to secure it in place, and the intermediate product thus obtained kept for lamination subsequently.

The apparatus described can be modified further so that the foam layer 48 is not included in the product, the webs 6,8 being then bonded directly together with the element 46 between them. A foam layer can be applied to each of the webs 6,8 if desired, and may be convenient to form the or each foam-fabric laminate as a prior operation separate from the other steps described herein.

Although reference has been made throughout the specific description to electric blankets, it will be evident that the invention can also be applied to and embodied in heating pads for supplying heat in situations other than those in which electric blankets are employed.

CLAIMS

1. An electric heating panel comprising first and second layers of flexible material laminated together by adhesive and an electric heating element received between the layers, the adhesive being a hot melt adhesive.

2. An electric heating panel as claimed in claim 1 wherein the hot melt adhesive is such as not to bond with the outer surface of the heating element.

3. An electric heating panel as claimed in claim 1 or 2 wherein the hot melt adhesive is a polyethylene adhesive.

4. An electric heating panel as claimed in claim 1 or 2 wherein the hot melt adhesive is a mixture of polyamide and polyethylene adhesives.

5. An electric heating panel as claimed in claim 2, 3, 3 or 4 wherein the first and second layers comprise non-woven fabric layers.

6. An electric heating panel as claimed in any preceding claim wherein at least one of the first and second layers comprises an outer fabric layer and an inner layer of foam material bonded to the fabric layer.

7. A method of manufacturing an electric heating panel wherein

first and second layers of flexible material are fed into surface-to-surface engagement between pressure rollers, the engaged surface of at least one of the layers having hot melt adhesive thereon

the hot melt adhesive is heated prior to engagement with the other layer, so as to be able to bond the layers together, and an

elongate electric heating element means is positioned between the layers, whereby the layers are laminated together with the electric heating element therebetween.

8. A method as claimed in claim 7 wherein the electric heating element is positioned between the layers during the passage of the layers between the pressure rollers.

9. A method as claimed in claim 7 or 8 wherein the hot melt adhesive is applied to the surface of the at least one layer in particulate form, or in net or sheet form.

10. A method as claimed in claim 7, 8 or 9 wherein the layers are subjected to a drying operation prior to the heating of the adhesive.

11. A method as claimed in claim 7,8,9 or 10 wherein the adhesive is applied to the at least one layer during movement of the layer between a supply source thereof and the pressure rollers.

12. An apparatus for manufacturing an electric heating panel, the apparatus comprising supply means for supplying first and second layers from supply sources on respective first and second paths

to pressure rollers and for feeding the webs in surface-to surface- engagement between the pressure rollers, with at least one of the engaging surfaces having a hot melt adhesive thereon, a heater for heating the adhesive prior to entry of the associated layer to between the pressure rollers, and a device for feeding an electric heating element between the layers as the layers are fed between the pressure rollers.

13. An apparatus as claimed in claim 12 having a device on at least one of the paths for applying the adhesive to the layer thereon.

14. An apparatus as claimed in claim 12 or 13 having means on each of the paths adjacent the supply sources for drying the layers.

15. An apparatus as claimed in claim 12, 13 or 14 wherein the first and second paths extend generally horizontally to the pressure rollers, the supply means feeding the layers downwardly from the pressure rollers.

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